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MONTHLY PROGRESS REPORT
ON THE
FEASIBILITY AND DESIGN STUDY FOR COLLECTIVE
PROTECTION EQUIPMENT FOR THE AN/MSG-4 SYSTEM

XEROX

CONTRACT NO: DA 18-108 CML-6618

REPORT PERIOD: Technical Report, 1 December 1961 to
1 January 1962 (6th Month)
Financial Report, 1 December 1961 to
1 January 1962 (6th Month)

62-2-1

TO: Commanding Officer
U. S. Army Chemical Research and
Development Laboratories

ATTENTION: Contract Project Officer
U. S. Army Chemical Center
Edgewood, Maryland

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PURPOSE OF THE STUDY

The purpose of this study is to evaluate the feasibility of installing collective protection (air filtration) equipment on semitrailer vans, trucks, and air-transportable shelters that contain the various subsystems of the AN/MSG-4 Antiaircraft Defense System. The collective protection equipment will include: a chemical, bacteriological, and radiological (CBR) filter for filtering irritating, noxious, and toxic gases and aerosols from the air; a pressure-control device to maintain minimum pressure of the air conditioning system; and an air lock that permits personnel to make safe entry and exit from the various vehicles and shelters. Mock-ups of proposed CBR filters and a mockup of a protective entrance will be fabricated following completion of the initial phase of the feasibility study. The activities during the month of December are described as follows.

GENERAL

During the month of December the major effort was devoted to the preparation of mock-ups scheduled to be evaluated during the first week in January, 1962, and to the selection of a design concept for the Antenna Trailer Filter Unit. A mock-up was completed for the Filter Unit

proposed to serve the AN/MSQ-28, AN/MSQ-18, and AN/MSQ-23 systems, Antenna Trailer excepted. This Filter Unit will hereafter be referred to as the 400 cfm Filter Unit. A mock-up was also completed of the Protective Entrance for the AN/MSQ-28 WMC and RDPC vehicles.

STUDY PROGRESS

Filter Unit (AN/MPS-23 Radar Antenna Trailer)

Three basic designs were evaluated before a firm design was established for the Antenna Trailer Filter Unit. Designs considered were described in the 5th monthly progress report, and the one selected is designated as Design C. The Filter Unit is of the blow-through type, mounted on a skid base. Filtered air will be delivered directly to the suction plenum of the two blowers used to inflate and maintain the radome pressure.

A test was made to determine required air delivery capacity for the Filter Unit. Basic objectives of the test were:

1. To determine if the radome could be maintained in a fully inflated condition with only one radome blower in operation.
2. To determine the maximum air delivery capacity of the one radome blower maintaining the radome.

The method used to determine the first objective was to open the personnel access port in the radome for 15 seconds and to measure the radome pressure at the end of the 15 second time interval. The 15 second time interval was selected as ample for normal ingress and egress. The external zippered opening in the air lock was closed all the time the radome access port was opened. The pressure fell from 6.2-inch water gage to 4.4-inch water gage, which is safely above the pressure level at which the antenna is automatically prevented from rotating. With the data obtained from this test the radome blower performance curve was reviewed and the maximum blower capacity was determined to be 640 cfm.

The test results suggested the use of two 400 cfm Filter Units operating in parallel to satisfy the filter requirements of the Antenna Trailer. A blower-system balance curve was plotted on this basis to determine feasibility. The curve indicated that the pressure within the radome would rise from a normal pressure of 6.2-inch water gage to approximately 8.0-inch water gage, and that the blower system would deliver approximately 760 cfm of air when the filters were clean. The condition described is for stable operation.

Drawings are being prepared for the mock-up of the Antenna Trailer Filter Unit. The Filter Unit will utilize two 400 cfm Filter Unit modules which will be stacked and mounted horizontally on a skid base. The modules will deliver filtered air into a common discharge header to which a flexible radome supply hose will be attached. A duct storage box will be mounted directly above the top filter module. Adequate handling provisions will be provided to allow the assembly to be moved by fork lift truck, skidded, or lifted by the eye bolts installed in the top four corners of the filter assembly frame.

The Filter Unit modules will contain the standard automatic damper systems for the sake of interchangeability. It is the intent, however, to permit the dampers to remain in the fully opened position and let the pressure in the radome decrease as the filters become loaded. This operational simplification is possible because the radome air flow requirement will never exceed the Filter Unit safe filtering capacity with the dampers open.

DESIGN PROGRESS

Filter Unit Mock-up (400 cfm unit)

The detailed engineering sketches required for the fabrication of the 400 cfm Filter unit mock-up were completed during this reporting period.

Filter Unit Mock-up (AN/MPS-23 Antenna Trailer)

The detailed engineering sketches required for Antenna Trailer Filter Unit were begun during this reporting period and are scheduled for release by 5 January 1962.

Protective Entrance Mock-up (AN/MSQ-28 WMC and RDPC Vehicles)

The design for the Protective Entrance was completed during the previous reporting period. The designs for the support beam, spreader bar, and door frame were completed for fabrication during this reporting period.

FABRICATION PROGRESS

400 cfm Filter Unit Mock-up

Fabrication was completed during this period.

Protective Entrance Mock-up (AN/MSQ-28 WMC and RDPC Vehicles)

The fabric assembly of the Protective Entrance was completed. Upon receipt of the canvas assembly, the door frame was attached to the fabric coupling. The support beam and spreader bar were also fabricated during this period.

MOCK-UP EVALUATION

Protective Entrance (AN/MSQ-28 WMC and RDPC Vehicles)

The Protective Entrance was installed on an RDPC vehicle to evaluate ease of installation, air leakage through slide fasteners and seals, ease of ingress and egress, the ability of the Protective Entrance to maintain its shape, and other characteristics.

1. The Protective Entrance is provided with a coupling to connect it to the vehicle. On one side of the coupling is attached a door frame which connects to the vehicle by Camloc fasteners. The other side of the coupling connects to the Protective Entrance by means of a slide fastener. The coupling can be semi-permanently installed on the vehicle, and it is further intended that the support beam can remain in place after the vehicle is placed into operation, especially if a CBR alert is anticipated.

The following steps are required to install the Protective Entrance after the coupling and support beam are in place:

- a. The spreader assembly under the top ceiling of the entrance is placed in position while Protective Entrance is on the ground.
- b. The rope attached to the ring in the top of the Protective Entrance is placed over the pulley in the support beam, and the Entrance is hoisted into place by personnel on the ground. The ring is then secured to the support beam.
- c. The Protective Entrance is then zipper-connected to the coupling which attaches to the vehicle.

The mock-up Protective Entrance was installed several times by carrying the Entrance up a ladder and connecting it to the beam. A pulley was then added to the beam to assist in hoisting the entrance. After further evaluation it was decided to replace the hook with a mechanism that would automatically catch and hold the supporting ring as it is pulled into place. This latter feature is being designed. It is believed that the Protective Entrance as designed can be quickly installed with a minimum of operating personnel instruction.

2. The air leakage rate through Mock-up Entrance zippers and seals is quite low considering that it is not a production item. The air seal flaps provided to cover the slide fasteners installed in the coupling and the door do not function as intended because they do not lay flat due to incorrect fabrication. This will be corrected.
3. The rectangular access opening was found to be too long. Personnel entering the entrance invariably fully opened the slide fastener providing a larger opening than required for easy access. It therefore took longer than necessary to close the fastener. Subsequent designs will be provided with smaller doors of crescent shape.
4. 180 cfm of air was delivered to the Protective Entrance. The static pressure within the entrance was 0.6-inch water gage when the contaminated air leakage ports were fully opened. The pressurized Entrance maintained its shape even when buffeted by high gusty winds. Although it was not staked to the ground, the Entrance, however, is designed to be staked to the ground to keep the bottom in place and maintain the proper shape when not pressurized.
5. The fabric assembly, not including the coupling, weighs approximately 25 pounds. The prototype will be lighter because the neoprene-coated nylon fabric used in the mock-up weighs 16 ounces per square yard, while specified fabric for prototype weighs 15.5 ounces per square yard. The prototype fabric will be butyl-coated and in accordance with the Chemical Corps drawing B5-19-1531.

For stowage purposes, the fabric assembly can be folded into a shape 24 inches long by 14 inches wide by 11 inches high.

400 cfm Filter Unit

The cam operated filter sealing mechanism was operated to evaluate its ease of operation and its ability to bring all seals together effectively. This was a visual inspection only without the application of air pressure for testing. On the basis of the visual inspection, it has been concluded that the method of sealing is satisfactory.

The weather shield is designed to give the lowest possible velocity to the air entering the Filter Unit considering the space available. The rain shield will, however, require a positive means of locking it in the open position. It could be accidentally closed by wind or a heavy shock as presently designed.

The dampers, automatic and manual, appear to be functional but will require further testing in the prototype stage.

FINANCIAL SUMMARY

The funds expended, man hours expended, estimated costs for the next reporting month, and the balance of contract funds are shown in the following summary:

	December 1961		Cumulative thru December 1961		Estimated for January	
	Man Hours	Total Dollars	Man Hours	Total Dollars	Man Hours	Total Dollars
Expenditures*	1350	\$10,983	3241	\$30,914	304	\$2,900

Contract Cost Funds** \$46,025.00

Less Cumulative Costs 30,914.00

Balance Remaining 15,111.00

*Expenditures shown are actual expenditures and include G & A.

**Contract cost funds are funds negotiated excluding fee.

PLANNED ACTIVITY FOR THE REMAINDER OF THE PHASE 1
STUDY PROGRAM

During the remainder of the Phase 1 Study Program the following work is scheduled:

1. During the 2nd week in January 1962, Army Chemical Center Representatives will visit the Hughes Aircraft Company for the purpose of evaluating the mock-ups.
2. The design drawings for the AN/MPS-23 Antenna Trailer Filter Unit Mock-up will be completed and submitted for fabrication. This mock-up is scheduled for completion by 2 February 1962.
3. The new attaching device will be installed on the support beam for the Protective Entrance Mock-up for the AN/MSQ-28 WMC and RDPC vehicles for evaluation of operating characteristics.
4. The basic design concept of the Filter Unit serving the AN/GSS-1D System will be established. Detailed drawings and mock-up will not be generated in the Phase 1 study.
5. The final report will be prepared and is scheduled for submittal on 16 March 1962.

HUGHES AIRCRAFT COMPANY
Ground Systems Group

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